



July 10, 2008

Mr. Bob Boggs  
California Department of Toxic Substances Control  
700 Heinz Avenue, Suite 200  
Berkeley, CA 94710-2721

**Subject: Machine Gun Butt Field Investigation Report, dated July 2008  
Presidio of San Francisco, California**

Dear Mr. Boggs:

Enclosed are one hard copy and one electronic copy of the *Machine Gun Butt (MGB) Field Investigation Report, Presidio of San Francisco, California* prepared by EKI for the Presidio Trust (Trust). This report concludes that there are no significant contaminant impacts at the MGB from the former firing range. Based on the findings of this recent investigation, we conclude that the no further action (NFA) remedy recommended in the *Draft Small Arms Firing Ranges Feasibility Study Report* (Treadwell & Rollo, 2004) for the MGB is still appropriate. We intend to proceed with a NFA remedy decision for the MGB in the upcoming Remedial Action Plan 4 (RAP4).

Please contact Genevieve Coyle or me at (415) 561-4293 or 561-4259, respectively if you have any questions.

Sincerely,

*Eileen Fanelli*

Eileen Fanelli  
Environmental Remediation Program Manager

Enclosure

Cc (with enclosure):

Agnes Farres, Water Board  
Brian Ullensvang, NPS  
Doug Kern, Presidio RAB  
Mark Youngkin, RAB (cover letter only)

34 Graham Street, Post Office Box 29052, San Francisco, California 94129-0052  
415/561-5300 Fax 561-5315 [presidio@presidiotrust.gov](mailto:presidio@presidiotrust.gov)

9 July 2008

Ms. Genevieve Coyle  
Presidio Trust  
34 Graham Street  
Post Office Box 29052  
San Francisco, California 94129-0052

Subject: **Machine Gun Butt  
Field Investigation Report  
Presidio of San Francisco, California  
(EKI A70004.11)**

Dear Ms. Coyle:

On behalf of the Presidio Trust ("Trust"), Erler & Kalinowski, Inc. ("EKI"), has prepared this field investigation report documenting the implementation and results of the Field Sampling Plan ("FSP") (EKI, 2008) at the Machine Gun Butt Area ("MGB" or "Site"). The Site is located within the Crissy Field Planning District of the Presidio of San Francisco (see Figure 1).

The field sampling activities for the FSP included soil sampling at eight shallow borehole locations where previous sampling by the Army indicated the presence of elevated zinc within shallow soil at the Site.

This report documents site background and history, discusses field procedures, presents the sampling results, and compares the results to Site-specific cleanup levels.

## **BACKGROUND**

The MGB is located in Area B, within Crissy Field, south of former Building 637 (Figures 1 and 2). The MGB was used as a firing range for machine guns during the late 1930s and early 1940s. A motor pool area, known as the Building 637 Area, was constructed at the Site following its use as a firing range. Remedial investigation and cleanup activities at the Site and the Building 637 Area are described in detail in the FSP (EKI, 2008).

The Army's 1996 soil sampling at the MGB identified only one location with a lead concentration of 477 milligrams per kilogram (mg/kg) that was associated with recovery of a single bullet (Montgomery Watson, 1997). Montgomery Watson (1997) concluded that low lead levels at the MGB were likely the result of previous munitions removal by the Army or the result of excavation activities associated with Building 637 in 1993. Additionally, the Trust's sampling in 2003 did not identify any locations with lead

concentrations above the site-specific lead cleanup level of 300 mg/kg (Treadwell & Rollo, 2004a).

Elevated zinc concentrations up to 1,100 milligrams per kilogram (“mg/kg”) were detected by the Army’s X-Ray Fluorescence Spectroscopy (“XRF”) analysis in 1996 (Montgomery Watson, 1997). XRF is a field analysis method used for screening purposes. The Army’s XRF data were not confirmed by the Trust’s 2003 investigation using a fixed laboratory for analysis (Treadwell & Rollo, 2004a). However, the soil sample locations from the Trust’s 2003 investigation did not coincide with the sample locations from the Army’s 1996 investigation. To address this data gap of whether the elevated zinc detections by XRF were real, this 2008 investigation included sampling from the same locations as the previous Army samples and performing metals analysis in a fixed laboratory (EKI, 2008).

The applicable cleanup levels for the Site, as defined in the *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water* (“Cleanup Level Document”) (EKI, 2002), are associated with buffer zone ecological and human health recreational land uses. Treadwell & Rollo (2004a) indicated that the predominant site lithologies were serpentinite and beach/dune sand. The Cleanup Level Document identifies the Colma lithology and artificial fill as the predominant surface soil at the MGB.

The Data Quality Objectives (“DQOs”) from the FSP are presented in Attachment C for reference.

## **FIELD PROCEDURES**

Field investigation activities were performed in general accordance with the Presidio-wide Quality Assurance Project Plan (“QAPP”) (Tetra Tech, 2001). Field methods and procedures and standard operation procedures were presented in the FSP.

Prior to the soil sampling event, the locations of the Army’s previous 1996 soil borehole locations were surveyed by PLS Surveys, Inc. of Oakland, California, a State of California-licensed land surveyor. Coordinates were digitized from the Army’s sampling figure presented in Montgomery Watson’s report (1997). Because of extensive overgrown vegetation in the sampling locations at the time of surveying, reference points were placed at approximately 50 foot and 100 foot offsets from the original Army sampling locations. These offsets were recorded by the surveyor and marked in the field to create a line to facilitate location of the original sampling locations after removal of the brush. The surveyor’s report is presented in Attachment D.

EKI conducted brush removal activities on 1 May 2008 before soil sampling. Sample locations corresponding to the Army’s previous sample locations (shown on Figure 2)

were then measured and located using the surveyed offsets. Brush removal was not anticipated in the FSP but was needed to implement the FSP.

Eight shallow boreholes were completed using a hand auger on 1 May 2008. The sample locations are shown on Figure 2. Soil lithology was documented under the supervision of a professional geologist and is included in Table 2. Per the QAPP, two field duplicates were collected.

Curtis & Tompkins, LTD. ("Curtis & Tompkins") of Berkeley California, a state-certified analytical laboratory, analyzed the soil samples. The laboratory reported results for the individual metals chromium, cobalt, copper, lead, and zinc after analysis by EPA Method 6020. Additionally, results for vanadium were reported for four samples. Laboratory analytical reports for soil samples are included as Attachment E.

Data validation was performed by DataVal of Novato, California. DataVal reviewed Level III and Level IV data packages provided by Curtis & Tompkins. All data are acceptable for use. The data validation report is included as Attachment F.

## RESULTS OF FIELD SAMPLING

No bullets or bullet fragments were found during this investigation. Analytical results of soil sampling from this investigation are presented in Table 1. Lead and zinc analyses provide information about potential environmental impacts from former firing range activities. Chromium, cobalt, nickel, and vanadium analyses provide lithological information. Vanadium analysis was not identified in the FSP, but was added to confirm soil lithology.

Metals concentrations in all samples were less than the residential and recreational human health cleanup levels (Table 1). At several locations, zinc concentrations exceeded the ecological buffer zone cleanup level of 60 mg/kg (based on Colma formation) and background concentrations of zinc in beach/dune sand and serpentinite formations of 66 and 160 mg/kg, respectively (Figure 2). Table 2 compares zinc data from this investigation to corresponding Army sample results at the same locations. As shown in Table 2, the elevated concentrations of zinc detected by the Army were not confirmed by the Trust's samples. Zinc concentrations from this investigation ranged from 45 to 230 mg/kg, compared to a range of 60 to 1,100 mg/kg by the Army's XRF analysis. At boring MGBSB106, where the Army found zinc at a maximum of 1,100 mg/kg by XRF, the laboratory zinc concentration was only 120 mg/kg.

To evaluate the zinc concentrations detected in soil samples, EKI conducted a statistical assessment of zinc data using laboratory sample results (i.e., results from this current investigation and the Trust's 2003 investigation). The Army's XRF results were not included in the statistical evaluation because they were not confirmed by laboratory



analysis and sample locations with elevated zinc XRF results were re-sampled during this investigation. At the suggestion of the Department of Toxic Substances Control (DTSC) on other Trust projects, EKI calculated the 95% upper confidence limit of the mean ("95% UCL") zinc concentration in soil using U.S. EPA's statistical package *ProUCL v. 4.0* (USEPA, 2007). The 95% UCL as estimated by the *Pro UCL* program is presented in Table 3. Attachment H presents the detailed UCL statistics for zinc from the Pro UCL program. The 95% UCL for zinc was estimated at 61 mg/kg. This 95% UCL concentration for zinc is also within background for the serpentinite (160 mg/kg) and beach/dune (66 mg/kg) lithologies and roughly equivalent to the Colma lithology background concentration of 60 mg/kg.

Nickel and chromium were also detected above ecological buffer zone cleanup levels. As stated above, nickel and chromium analyses were conducted to provide lithological information. These contaminants are not expected from former firing range activities at the site. The observed lithology at the Site during this investigation was top soil, beach/dune sand and Colma. Treadwell & Rollo (2004) noted the presence of serpentinite lithology during their investigation. The concentrations of nickel and chromium found in soil samples during this investigation (see Table 1) were compared to background concentrations of nickel and chromium in both Colma and serpentinite soils found in the Presidio. As can be seen in the scatter plot provided in Attachment G, the Colma and serpentinite soils plot in distinct groupings, with serpentinite soils having higher concentrations of both nickel and chromium. The plot in Attachment G shows that the MGB sample points mostly fall within the Colma soil group. However, four of the samples taken for this investigation had higher levels of both nickel and chromium. These samples plot in a direct line with the background serpentinite soils. The concentrations of nickel and chromium in soil samples are within the range and general proportions indicative of the chemical signature of serpentinite soil. As the soil lithology at MGB is a mixed topsoil, it is reasonable that some serpentinite mixed with Colma is present. Therefore chromium and nickel are considered naturally occurring in the soil matrix.

## CONCLUSIONS AND RECOMMENDATIONS

Conclusions from this soil sampling investigation are as follows:

- Similar to Montgomery Watson (1997) and Treadwell & Rollo (2004a), no significant lead impact was identified at the MGB during this investigation.
- No bullets or bullet fragments were found during the investigation.
- Laboratory analysis of soil samples collected in the same locations as the Army's previous samples for XRF analysis did not confirm the Army's elevated concentrations of zinc at the Site.
- Metals concentrations in shallow soil were less than residential and recreational cleanup levels indicating that the site is suitable for unrestricted human land use.

Letter to Ms. Coyle  
MGB Field Investigation Report  
9 July 2008  
Page 5 of 6

- The 95% UCL calculated for zinc was within the range of background concentrations for Site soil.
- Topsoil, Colma formation, and beach/dune sand were the lithologies found during soil sampling of the top 1 foot for this investigation.
- Scatter plots of nickel and chromium concentrations in soil samples indicate that Site soils likely contain some serpentinite. Nickel and chromium concentrations are attributed to background conditions.

Based on the results of this investigation, we conclude that there are no significant contaminant impacts at the MGB from the former firing range. Therefore, the no further action remedy recommended in the *Draft Small Arms Firing Ranges Feasibility Study Report* (Treadwell & Rollo, 2004b) for the MGB is still appropriate.

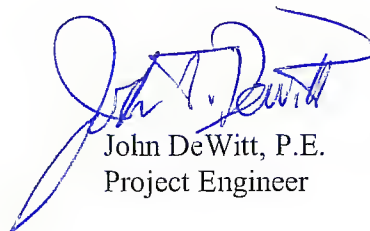
If you have any questions or wish to discuss these matters in greater detail, please do not hesitate to call.

Very truly yours,

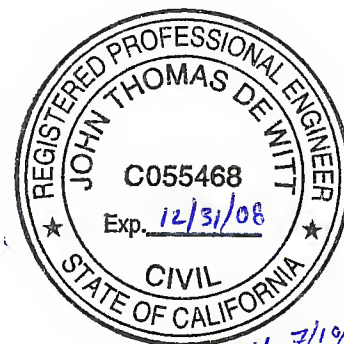
ERLER & KALINOWSKI, INC.



Adrienne Carr, Ph.D.  
Project Scientist



John DeWitt, P.E.  
Project Engineer



signed 7/19/08

## ATTACHMENTS

### A Tables

1. Summary of Soil Results for Metals
2. Comparison of Soil Analytical Results for Zinc Between Sampling Events
3. Summary of Statistical Evaluation of Zinc Results

### B Figures

1. Site Location Map
2. Lead and Zinc Results at Machine Gun Butt

### C Data Quality Objectives Tables from the April 2008 Field Sampling Plan

### D Survey Results

Letter to Ms. Coyle  
MGB Field Investigation Report  
9 July 2008  
Page 6 of 6

- E Laboratory Analytical Reports for Soil
- F Data Validation Report
- G Scatter Plot of Background Metals in Soil Samples
- H Backup Tables for Statistical Evaluation of Zinc Results

## REFERENCES

EKI, 2002. *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water, Presidio of San Francisco, California*. October, as revised in May 2006.

EKI, 2008. *Field Sampling Plan for the Machine Gun Butt, Presidio of San Francisco, California*. April.

Montgomery Watson, 1997. *Final Site Investigation Report for the Small Arms Firing Ranges, Presidio of San Francisco, California*, July 1997.

Tetra Tech, 2001. *Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan, Presidio of San Francisco, San Francisco, California*. April.

Treadwell and Rollo, Inc., 2004a. *Draft Small Arms Firing Ranges Remedial Investigation Report, Presidio of San Francisco, California*. February 2004.

Treadwell & Rollo, Inc., 2004b. *Draft Small Arms Firing Ranges Feasibility Study Report, Presidio of San Francisco, California*, November 2004.

USEPA, 2007. *ProUCL Version 4.0 Technical Guide*. EPA/600/R-07/041. April.

## **ATTACHMENT A**

### **TABLES**



**TABLE 1**  
**SUMMARY OF SOIL ANALYTICAL RESULTS FOR METALS**

Machine Gun Butt  
Presidio of San Francisco, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Analytical Results (mg/kg) (a)					
				Chromium	Cobalt	Lead	Nickel	Vanadium	Zinc
MGBSB101	MGBSB101(0.3)	5/1/2008	0.3	160	24	20	270	51	52
MGBSB102	MGBSB101(1.0)	5/1/2008	1	150	20	19	220	53	45
	MGBSB102(0.3)	5/1/2008	0.3	64	8.5	93	45	NA	49
	MGBSB102(1.0)	5/1/2008	1	61	8.2	93	41	NA	47
MGBSB103	MGBSB103(0.3)	5/1/2008	0.3	57	6.8	74	32	NA	220
	MGBSB103(1.0)	5/1/2008	1	61	8.3	42	40	NA	230
MGBSB104	MGBSB104(0.3)	5/1/2008	0.3	79	21	110	61	NA	53
	MGBSB104(1.0)	5/1/2008	1	110	24	67	140	50	53
MGBSB105	MGBSB105(0.3)	5/1/2008	0.3	62	9.3	35	50	NA	110
	MGBSB105(1.0)	5/1/2008	1	65	14	15	53	NA	56
MGBSB106	MGBSB106(0.3)	5/1/2008	0.3	85	12	33	66	NA	120
	DUP-2-050108	5/1/2008	0.3	85	17	34	67	NA	97
	MGBSB106(1.0)	5/1/2008	1	71	11	28	66	NA	85
MGBSB107	MGBSB107(0.3)	5/1/2008	0.3	82	12	36	71	NA	61
	MGBSB107(1.0)	5/1/2008	1	220	22	59	370	44	63
MGBSB108	MGBSB108(0.3)	5/1/2008	0.3	91	12	110	58	NA	100
	DUP-1-050108	5/1/2008	0.3	67	11	25	52	NA	75
	MGBSB108(1.0)	5/1/2008	1	70	14	18	54	NA	45
<b>Applicable Cleanup Levels</b>									
Ecological Buffer Zone Cleanup Level - Colma (b)				140 (c)	48	300	110 (c)	90 (c)	60 (c)
Presidio Background Metals Concentration for Beach/Dune				120	16	57	70	92	66
Presidio Background Metals Concentration for Serpentine				1,700	170	66	4,500	74	160
Human Health Residential Cleanup Level				1,200	4,000	400	1,400	650	22,000
Human Health Recreational Cleanup Level				2,800	10,000	500	3,500	1,600	52,000

**Abbreviations:**

mg/kg - milligrams per kilogram  
NA - not analyzed

**Notes:**

- (a) Soil sample results analyzed by EPA Method 6020 and reported on a dry weight basis.
- (b) Reported results above Ecological Buffer Zone Cleanup Levels are in **bold**.
- (c) Cleanup level based on background metals concentration in Colma formation lithology.

**TABLE 2**  
**COMPARISON OF SOIL ANALYTICAL RESULTS**  
**FOR ZINC BETWEEN SAMPLING EVENTS**

Machine Gun Butt  
Presidio of San Francisco, California

EKI Sample Location (2008)	Sample ID	Sample Depth (ft bgs)	Lithological Unit (2008)	Observed Lithology (2008) (a)	Laboratory Analysis of Zinc (b)	Corresponding Army Sample Location (1996)	Sample Depth (ft bgs)	XRF Analysis of Zinc (c)
MGBSB101	MGBSB101(0.3)	0.3	Topsoil	organic, silty sand topsoil	52	637BR62	0.3	60
	MGBSB101(1.0)	1	Colma	semi-consolidated sand	45		1	79
MGBSB102	MGBSB102(0.3)	0.3	Topsoil	organic, sandy topsoil	49	637BR64	0.3	95
	MGBSB102(1.0)	1	Topsoil	organic, sandy topsoil	47		1	84
MGBSB103	MGBSB103(0.3)	0.3	Topsoil	silty sand topsoil	220	637BR65	0.3	91
	MGBSB103(1.0)	1	Colma	semi-consolidated Sand	230		1	82
MGBSB104	MGBSB104(0.3)	0.3	Dune Sand	unconsolidated sand	53	637BR66	0.3	76
	MGBSB104(1.0)	1	Colma	clayey sand	53		1	85
MGBSB105	MGBSB105(0.3)	0.3	Dune Sand	clayey sand	110	637BR69	0.3	600
	MGBSB105(1.0)	1	Colma	sand	56		1	160
MGBSB106	MGBSB106(0.3)	0.3	Topsoil	loose, sandy topsoil	120		0.3	1,100
	DUP-2-050108	0.3	Topsoil	"	97	637BR70	--	--
	MGBSB106(1.0)	1	Topsoil	loose sandy topsoil	85		1	700
MGBSB107	MGBSB107(0.3)	0.3	Dune Sand	unconsolidated sand	61	637BR71	0.3	64
	MGBSB107(1.0)	1	Colma	slightly consolidated Sand	63		1	330
MGBSB108	MGBSB108(0.3)	0.3	Topsoil	organic topsoil	100		0.3	720
	DUP-1-050108	0.3	Topsoil	"	75	637BR72	--	--
	MGBSB108(1.0)	1	Colma	semi-consolidated sand w/clay	45		1	170
<b>Applicable Cleanup Levels</b>								
Ecological Buffer Zone Cleanup Level - Colma (d)								
Presidio Background Metals Concentration for Beach/Dune								
Presidio Background Metals Concentration for Serpentine								
Human Health Residential Cleanup Level								
Human Health Recreational Cleanup Level								
22,000								
52,000								

**Abbreviations:**

-- - Not applicable  
mg/kg - milligrams per kilogram  
XRF - X-ray Fluorescence Spectroscopy

**Notes:**

- (a) No metal flakes were observed in any of the borings.
- (b) Soil sample analyzed by EPA Method 6020 and sample results reported on a dry weight basis.
- (c) Soil sample analyzed by energy dispersive x-ray fluorescence.
- (d) Reported results above applicable cleanup levels are in **bold**.

**TABLE 3**  
**SUMMARY OF STATISTICAL EVALUATION OF ZINC RESULTS**  
Machine Gun Butt  
Presidio of San Francisco, California

Sample Depth Range	Zinc		
	Number of Samples (a)	Concentration Range (mg/kg)	95% Upper Confidence Limit (mg/kg) (b)
0 - 2 ft bgs (b)	52	13 - 230	61
Applicable Cleanup Levels (EKI, 2002)			
Ecological Buffer Zone - Colma (0-3 ft bgs)		60 (c)	
Background Concentration for Beach/Dune		66	
Background Concentration for Serpentine		160	
Human Health Residential (0-2 ft bgs)		22,000	
Human Health Recreational (0-2 ft bgs)		52,000	

**Abbreviations:**

ft bgs - feet below ground surface  
mg/kg - milligrams per kilogram  
UCL - Upper Confidence Limit

**Notes:**

- (a) Samples included in this evaluation were collected by the Trust in 2003 and 2008. No Army data was included in this analysis. See text for additional details. See Appendix F for backup data.
- (b) The 95% upper confidence limit was calculated using the U.S. EPA's Pro UCL v. 4.0 software.
- (c) Cleanup level based on background concentrations for Colma.

**References:**

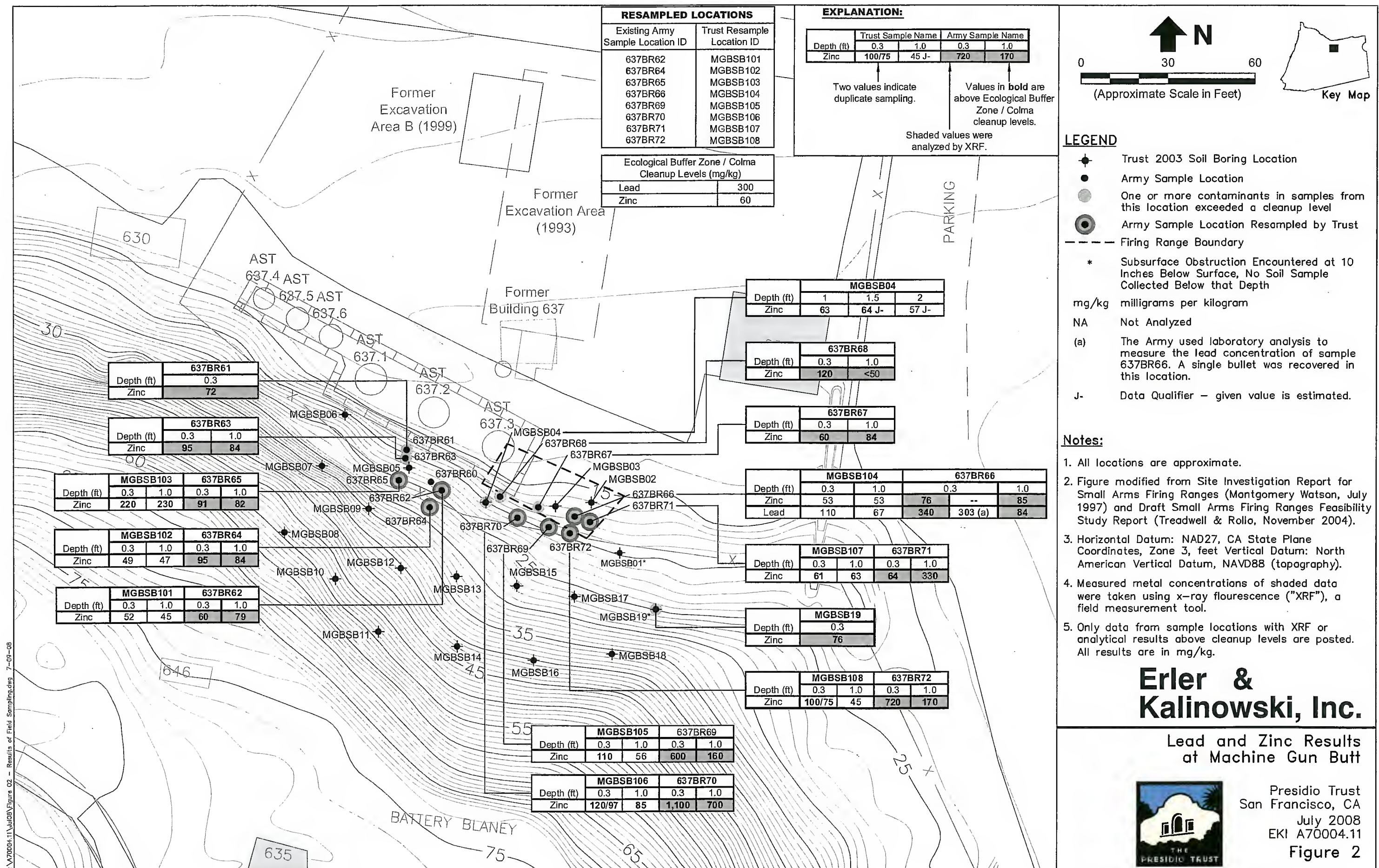
EKI, 2002. Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater, and Surface Water, Presidio of San Francisco, California. October.

**ATTACHMENT B**

**FIGURES**









**ATTACHMENT C**

**DATA QUALITY OBJECTIVES TABLE**  
**FROM THE APRIL 2008 FIELD SAMPLING PLAN**

**DRAFT**

**TABLE 1 – DRAFT  
MACHINE GUN BUTT SAMPLING DATA QUALITY OBJECTIVES**  
Presidio of San Francisco, California

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define the Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
Concentrations of lead and zinc detected in soil samples collected by the Army and the Trust at the Machine Gun Butt ("MGB") exceed site-specific Presidio cleanup levels for these chemicals.  Previous sample results from the Army using x-ray fluorescence ("XRF") showed some zinc concentrations were significantly greater than cleanup levels, and other concentrations were only slightly greater than background levels. The presence of elevated concentrations of zinc was not resolved by Trust sampling in 2003.  Screening of chemicals of concern in the Small Arms Firing Range Feasibility Study is based on the most conservative lithology observed, which may not be appropriate for the samples with the slightly elevated zinc concentrations.	1. What is the appropriate lithology for determining cleanup levels based on the samples from the MGB?  2. Are zinc and lead concentrations present in soil at concentrations significantly above site-specific cleanup levels?  3. Can previous Army sample results using XRF be confirmed by laboratory analysis?	1. Results of previous chemical analysis of soil samples from the MGB collected by the Army and the Trust. Army data were collected by XRF, which is a field screening method and is considered qualitative.  2. Results of laboratory analyses from this soil resampling event.  3. If necessary, comparison of specific elements on log-probability plots with Presidio-specific background data to determine lithology.  4. Comparison of analytical results with applicable cleanup levels.	The study boundary for the characterization investigation is the MGB area near former AST 637.3. The area going uphill to the south towards Battery Blaney has already been characterized and is not included in this study area.  The boundaries are further limited to the locations of specific previous samples collected by the Army.	Select soil lithology based on field observations, measured concentrations, and comparison with Presidio-specific background data.  Select appropriate cleanup levels based on lithological assessment.  If concentrations of lead or zinc in soil samples exceed site-specific cleanup levels based on lithology, the data will be further evaluated (potentially including statistical analysis of site data) to assess whether remedial actions are warranted.  If concentrations of lead or zinc in soil samples collected in this sampling event do not exceed site-specific cleanup levels based on lithology, then the results of the sampling will be documented, and the combination of new and existing data will be used to justify no further action at the site.	1. Field, analytical, and data validation procedures will follow the QAPP (Tetra Tech, 2001) to the extent possible. Duplicate soil samples will also be collected per the QAPP.  2. A potential error in evaluation of soil samples would be to incorrectly quantify the chemicals present in soil. The acceptable range of decision error would be a consequence of field and/or analytical errors and will be evaluated during the data validation procedures.  3. A potential error could be to incorrectly locate the previous samples. These points will be surveyed prior to the sampling event.	1. Eight new soil borings (MGBSB101 through MGBSB108) will be installed, as shown on Figure 1. Samples will be collected from 4 and 12 inches below ground surface from each boring. These samples will be analyzed by US EPA Method 6020 for lead and zinc to confirm XRF results, and for chromium, nickel, and cobalt to evaluate lithology.  2. Samples from MGBSB101 through MGBSB103 will be collected from the area west of the MGB to evaluate soil lithology and previous zinc detections slightly above background concentrations.  3. Samples from MGBSB104 through MGBSB108 will be collected to evaluate soil lithology and previous elevated concentrations of lead and zinc measured by the Army in the area of the MGB.

Abbreviation:  
QAPP

*Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan, Tetra Tech EM Inc., dated April 2001.*

**ATTACHMENT D**  
**SURVEY RESULTS**

July 2008

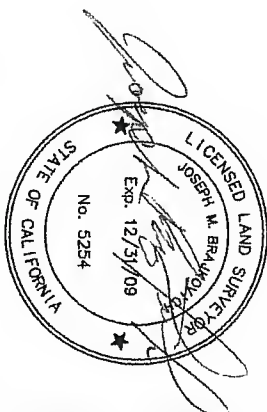
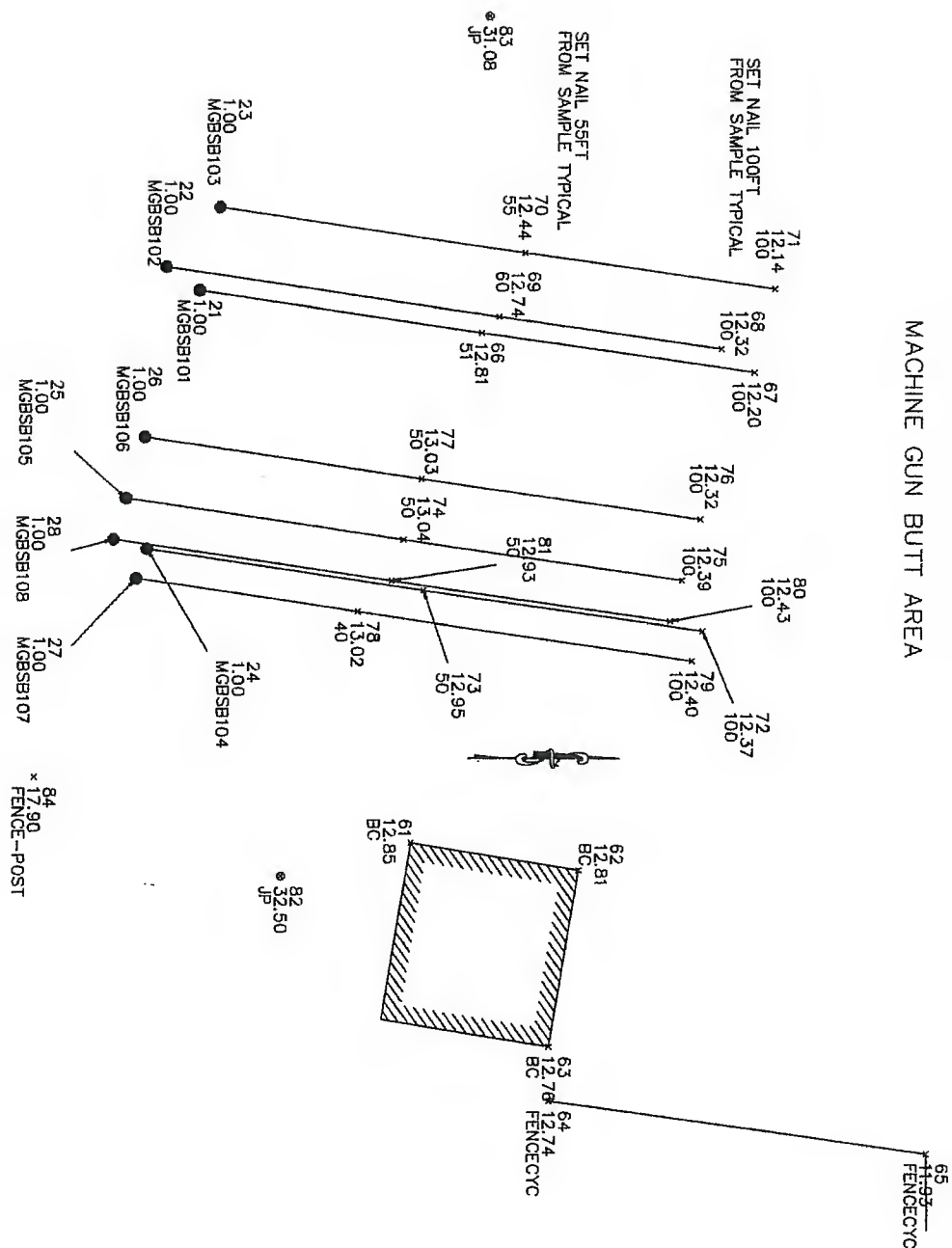
Machine Gun Butt  
Field Sampling Report

PT. NO.	NORTHING NAD 27	EASTING NAD 27	LATTITUDE	LONGITUDE	ELEVATION NGVD 29 GROUND	ELEVATION PLLW GROUND	DESCRIPTION	GPS CODE	ACCURACY CENTIMETER	HORZ. CODE	COMPANY	EQUIP.	DATE	ELEV CODE	CLASS
21	480178.94	1433556.97	32.0705220	-137.0626402			MGBSB101	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
22	480173.08	1433552.80	32.0705042	-137.0626501			MGBSB102	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
23	480182.50	1433542.10	32.0705244	-137.0626893			MGBSB103	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
24	480169.92	1433603.20	32.0705200	-137.0624889			MGBSB104	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
25	480166.19	1433594.12	32.0705056	-137.0625155			MGBSB105	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
26	480169.42	1433583.22	32.0705090	-137.0625518			MGBSB106	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
27	480168.03	1433608.49	32.0705175	-137.0624711			MGBSB107	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
28	480164.06	1433601.50	32.0705034	-137.0624910			MGBSB108	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
61	480217.17	1433655.20	32.0706723	-137.0623512	12.85	12.91	BC	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
62	480246.86	1433659.99	32.0707546	-137.0623528	12.81	12.87	BC	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
63	480241.69	1433691.49	32.0707558	-137.0622503	12.76	12.72	BC	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
64	480241.72	1433701.16	32.0707606	-137.0622197	12.74	12.80	FENCECYC	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
65	480308.94	1433710.27	32.0709460	-137.0622289	11.93	11.99	FENCECYC	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
66	480229.40	1433564.21	32.0706614	-137.0626459	12.81	12.87	51.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
67	480277.96	1433571.17	32.0707955	-137.0626513	12.20	12.26	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
68	480272.02	1433566.98	32.0707775	-137.0626612	12.32	13.38	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
69	480232.49	1433561.33	32.0706683	-137.0626567	12.74	12.82	60.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
70	480236.97	1433549.91	32.0706749	-137.0626954	12.44	12.50	55.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
71	480281.48	1433556.25	32.0707978	-137.0627005	12.14	12.20	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
72	480268.89	1433617.38	32.0707934	-137.0625000	12.37	12.73	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
73	480219.36	1433610.31	32.0706566	-137.0624944	12.95	13.01	50.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
74	480215.70	1433601.24	32.0706423	-137.0625210	13.04	13.10	50.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
75	480265.15	1433608.36	32.0707789	-137.0625265	12.39	12.45	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
76	480268.44	1433597.44	32.0707826	-137.0625628	12.32	12.38	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
77	480218.94	1433590.34	32.0706458	-137.0625573	13.03	13.09	50.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
78	480207.59	1433614.19	32.0706267	-137.0624755	13.02	13.08	40.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
79	480267.01	1433622.72	32.0707909	-137.0624821	12.40	12.46	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
80	480263.09	1433615.71	32.0707769	-137.0625020	12.43	12.49	100.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
81	480213.64	1433608.62	32.0706403	-137.0624965	12.93	12.99	50.00	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
82	480194.05	1433661.37	32.0706130	-137.0623186			JP	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
83	480230.60	1433507.63	32.0706374	-137.0628255			JP	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR
84	480150.24	1433643.88	32.0704866	-137.0623491			FENCE-POST	CONV	0.5	NAD 27	PLS SURVEYS INC.	L530	4/14/2008	TRIG	SUR



SAMPLE LOCATIONS HAVE BEEN STAKED WITH OFFSETS TO THEIR LOCATION

# MACHINE GUN BUTT AREA



**PLS SURVEYS, INC.**  
 LAND & HYDROGRAPHIC SURVEYORS  
 2220 Livingston Street, Suite 202  
 Oakland, California 94606-5203  
 510.261.0900 FAX 510.261.3303  
 e-mail: plssurv@pacbell.net

## SAMPLE LAYOUT MACHINE GUN BUTT AREA PRESIDIO

SAN FRANCISCO

CALIFORNIA

SCALE	1"=30'
DATE	04/18/2008
BY	JMB
JOB NO.	08-028

**ATTACHMENT E**  
**LABORATORY ANALYTICAL REPORTS FOR SOIL**

**ATTACHMENT F**  
**DATA VALIDATION REPORT**

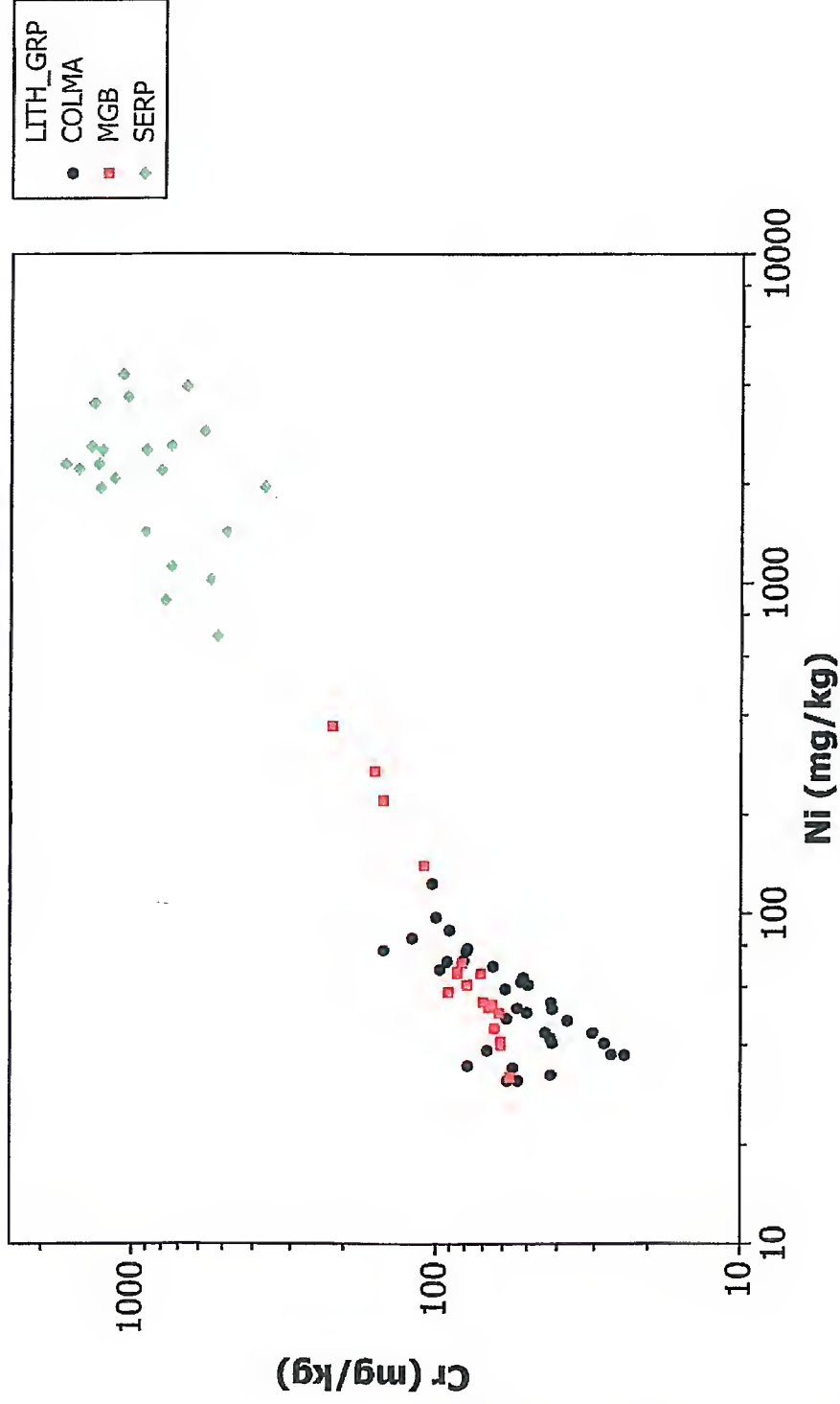
**(INCLUDED ON CD)**



**ATTACHMENT G**

**SCATTER PLOT OF BACKGROUND METALS IN SOIL SAMPLES**

**Scatterplot of Cr vs Ni**



**ATTACHMENT H**

**BACKUP TABLES FOR STATISTICAL EVALUATION OF ZINC RESULTS**

**TABLE 1**  
**ZINC SOIL RESULTS INCLUDED IN 95% UCL ANALYSIS**  
Machine Gun Butt  
Presidio of San Francisco, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Zinc (mg/kg) (a)
MGBSB101	MGBSB101(0.3)	5/1/2008	0.3	52
MGBSB101	MGBSB101(1.0)	5/1/2008	1	45
MGBSB102	MGBSB102(0.3)	5/1/2008	0.3	49
MGBSB102	MGBSB102(1.0)	5/1/2008	1	47
MGBSB103	MGBSB103(0.3)	5/1/2008	0.3	220
MGBSB103	MGBSB103(1.0)	5/1/2008	1	230
MGBSB104	MGBSB104(0.3)	5/1/2008	0.3	53
MGBSB104	MGBSB104(1.0)	5/1/2008	1	53
MGBSB105	MGBSB105(0.3)	5/1/2008	0.3	110
MGBSB105	MGBSB105(1.0)	5/1/2008	1	56
MGBSB106	MGBSB106(0.3)	5/1/2008	0.3	120
MGBSB106	MGBSB106(0.3) DUP-2-050108	5/1/2008	0.3	97
MGBSB106	MGBSB106(1.0)	5/1/2008	1	85
MGBSB107	MGBSB107(0.3)	5/1/2008	0.3	61
MGBSB107	MGBSB107(1.0)	5/1/2008	1	63
MGBSB108	MGBSB108(0.3)	5/1/2008	0.3	100
MGBSB108	MGBSB108(0.3) DUP-1-050108	5/1/2008	0.3	75
MGBSB108	MGBSB108(1.0)	5/1/2008	1	45
MGBSB02	MGBSB02[1]	7/22/2003	1	42
MGBSB02	MGBSB02[2]	7/22/2003	2	50
MGBSB03	MGBSB03[1]	7/22/2003	1	53
MGBSB03	MGBSB03[2]	7/22/2003	2	39
MGBSB04	MGBSB04[1]	7/22/2003	1	63
MGBSB04	MGBSB04[1] DUP072203A	7/22/2003	1.5	64
MGBSB04	MGBSB04[2]	7/22/2003	2	57
MGBSB05	MGBSB05[1]	7/22/2003	1	43
MGBSB05	MGBSB05[2]	7/22/2003	2	33
MGBSB06	MGBSB06[1]	7/22/2003	1	34
MGBSB06	MGBSB06[2]	7/22/2003	2	30
MGBSB07	MGBSB07[1]	7/22/2003	1	20
MGBSB07	MGBSB07[2]	7/22/2003	2	24

**TABLE 1**  
**ZINC SOIL RESULTS INCLUDED IN 95% UCL ANALYSIS**  
Machine Gun Butt  
Presidio of San Francisco, California

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Zinc (mg/kg) (a)
MGBSB08	MGBSB08[1]	7/22/2003	1	23
MGBSB08	MGBSB08[2]	7/22/2003	2	13
MGBSB09	MGBSB09[1]	7/22/2003	1	24
MGBSB09	MGBSB09[2]	7/22/2003	2	15
MGBSB10	MGBSB10[1]	7/22/2003	1	16
MGBSB10	MGBSB10[2]	7/22/2003	2	29
MGBSB11	MGBSB11[1]	7/21/2003	1	28
MGBSB11	MGBSB11[2]	7/21/2003	2	30
MGBSB12	MGBSB12[1]	7/21/2003	1	29
MGBSB12	MGBSB12[2]	7/21/2003	2	23
MGBSB13	MGBSB13[1]	7/21/2003	1	30
MGBSB14	MGBSB14[0.5]	7/21/2003	0.5	37
MGBSB14	MGBSB14[1]	7/21/2003	1	28
MGBSB15	MGBSB15[1]	7/21/2003	1	33
MGBSB16	MGBSB16[1]	7/21/2003	1	35
MGBSB16	MGBSB16[2]	7/21/2003	2	27
MGBSB17	MGBSB17[1]	7/21/2003	1	41
MGBSB17	MGBSB17[2]	7/21/2003	2	36
MGBSB18	MGBSB18[1]	7/21/2003	1	25
MGBSB18	MGBSB18[2]	7/21/2003	2	19
MGBSB19	MGBSB19[0.3]	7/21/2003	0.3	76
Minimum Concentration (mg/kg)				13
Maximum Concentration (mg/kg)				230
Total # of Samples				52

**Abbreviations:**

ft bgs - feet below ground surface  
mg/kg - milligrams per kilogram  
UCL - Upper Confidence Limits

**Notes:**

(a) Concentrations exceeding Colma ecological buffer zone cleanup levels are in **bold**.

**TABLE 2**  
**GENERAL UCL STATISTICS**  
Machine Gun Butt  
Presidio of San Francisco, California

General UCL Statistics

User Selected Options		
From File	WorkSheet.wst	
Full Precision	OFF	
Confidence Coefficient	95%	
Number of Bootstrap Operations	2000	
<b>Zinc (mg/kg)</b>		
General Statistics		
Number of Valid Observations	52	Number of Distinct Observations 41
Raw Statistics		Log-transformed Statistics
Minimum	13	Minimum of Log Data 2.565
Maximum	230	Maximum of Log Data 5.438
Mean	52.5	Mean of log Data 3.754
Median	41.5	SD of log Data 0.609
SD	42.45	
Coefficient of Variation	0.809	
Skewness	2.811	
Relevant UCL Statistics		
Normal Distribution Test		Lognormal Distribution Test
Lilliefors Test Statistic	0.22	Lilliefors Test Statistic 0.0803
Lilliefors Critical Value	0.123	Lilliefors Critical Value 0.123
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level
Assuming Normal Distribution		Assuming Lognormal Distribution
95% Student's-t UCL	62.36	95% H-UCL 60.73
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL 71.45
95% Adjusted-CLT UCL	64.64	97.5% Chebyshev (MVUE) UCL 80.21
95% Modified-t UCL	62.74	99% Chebyshev (MVUE) UCL 97.42
Gamma Distribution Test		Data Distribution
k star (bias corrected)	2.439	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	21.53	
nu star	253.7	
Approximate Chi Square Value (.05)	217.8	Nonparametric Statistics
Adjusted Level of Significance	0.0454	95% CLT UCL 62.18
Adjusted Chi Square Value	216.8	95% Jackknife UCL 62.36
		95% Standard Bootstrap UCL 62.26
Anderson-Darling Test Statistic	1.235	95% Bootstrap-t UCL 67.15
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL 73.94
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL 62.81
Kolmogorov-Smirnov 5% Critical Value	0.124	95% BCA Bootstrap UCL 63.96
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 78.16
		97.5% Chebyshev(Mean, Sd) UCL 89.26
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 111.1
95% Approximate Gamma UCL	61.15	
95% Adjusted Gamma UCL	61.42	
Potential UCL to Use		Use 95% Approximate Gamma UCL 61.15